REMARKS

Applicants respectfully request reconsideration of the present application in view of the reasons that follow. This submission is supplemental to the remarks filed October 31, 2007 together with a Request for Continued Examination and a Request for a three month suspension of action under 37 C.F.R. § 1.103(c).

The Claims Are Patentable Over Hammacher in view of Luke

Applicants respectfully submit that it would not have been obvious to combine Hammacher with Luke to achieve the current inventive embodiments. According to the examiner, a person skilled in the art would start from the detector of Hamacher and would replace the Boron doped layer by an undoped amorphous germanium layer in order to obtain a good blocking contact due to the Luke document.

Applicants submit that the combination of Hammacher with Luke is improper for two reasons. First, the motivation to combine put forward by the Examiner, the improvement of a blocking contact, did not exist in this field at the relevant point in time. Second, there was an active disincentive to use an amorphous Germanium layer as part of a contact, because it was expected that this would reduce the energy resolution of the detector.

No Motivation To Improve Blocking Contact

There was no motivation to combine Hammacher with Luke, because there was no motivation to improve the blocking ability of the Hammacher Boron-doped contact.

Attachment 1 to this submission is the declaration under 37 C.F.R. § 1.132 of the first-named inventor, Davor Protic, who has thirty years of experience developing semiconductor-based position sensitive detectors for charged particles or photons. *See* Protic Decl. ¶4.

As explained by Mr. Protic, the following features are of interest with regard to a detector:

- Of importance is the accuracy in the energy measurement.

- Of importance is to provide a detector with a good energy resolution in the measurement.
- Of importance is to provide a durable detector.
- It is often of importance to provide a detector with a good positional resolution.

See Protic Decl. ¶7.

The Examiner combined Hammacher with Luke, reasoning that a person of skill in the art would be motivated to provide Hammacher with a good blocking contact. However, as explained by Mr. Protic, the Boron-doped contact of Hammacher already provides an excellent contact. *See* Protic Decl. ¶¶5, 6, 8 and 11-12.

Typically, blocking contacts are provided to reduce the leakage current, which can affect the energy resolution of the device. *See* Protic Decl. ¶9. At temperatures where Germanium detectors are used commercially, however, the leakage current of a detector is quite small. *See* Protic Decl. ¶10. There is therefore no motivation to provide better blocking contacts for these sorts of detectors, because doing so will not improve the energy resolution. *See* Protic Decl. ¶10.

As further evidence of this, we submit herewith as Attachment 2 a newer article by Luke, with the citation M. Amman, P.N. Luke, S.E. Boogs, NUCLEAR INSTRUMENTS AND METHODS IN PHYSICS RESEARCH A 579 (2007) 886-890.

According to this article, page 887, left column, paragraph 1, Luke teaches:

> The standard contact technology for such a detector consists of a Li-diffused n+ contact and a B-implanted p+ contact. Both contact types are robust, can withstand high electrical fields, and lead to a low charge carrier injection.

The phrase "[l]ead to a low charge carrier injection" means that the leakage current is small.

Amorphous Germanium Was Believed To Decrease Energy Resolution

There was further no motivation to combine Hammacher with Luke at the relevant point in time because a person of ordinary skill in the art would have expected the use of an amorphous Germanium contact to decrease the energy resolution of the device.

As explained by Mr. Protic, experiments carried out with a contact of structured metal on top of an unstructured, amorphous Germanium layer resulted in a relatively poor energy resolution. *See* Protic Decl. ¶¶ 11-12. This is also described at the top of page 5 of the present application, where it is stated:

> However, experiments have shown that in the case of the above-named detector, with the structured metallic surface, only a comparatively poor energy resolution can be achieved. Furthermore, a relatively large number of measuring errors occur in the energy measurement.

With regard to an a-Ge contact, Luke et al. also teach in their newer article submitted as Attachment 2, (page 889, 3):

> Despite the substantial success achieved with Ge-based detectors fabricated using amorphous-semiconductor contacts, issues remain to be resolved before the full potential of the devices will be realized in large-scale instruments. These issues include excessive leakage at temperatures significantly above that of liquid nitrogen, leakage current degradation with temperature cycling, and charge collection to inter-contact surfaces. The excessive leakage current issue was discussed in the previous section and, can be addressed through the development and optimization of the a-Ge/Ge/a-Si detector configuration and other similar structures. Cycling temperature of an amorphous-contact Ge detector from cryogenic temperature to room temperature and then back to a low temperature again typically causes the leakage current of the detector to increase at the operating temperature. Such temperature cycling is unavoidable in the detector evaluation and instrument assembly process. <u>The gradual increase in the leakage caused by this cycling can ultimately lead to degraded energy resolution.</u> (emphasis added).

The teaching of Luke corresponds with the statements in the present application on page 4, last paragraph and page 5, first paragraph.

Thus, the person of ordinary skill in the art would have had no reasonable expectation of success in combining Hammacher with Luke. He or she would have expected that the replacement of Boron-dope contacts with amorphous Germanium contacts would have decreased the energy resolution of the device, while not appreciably decreasing the leakage current over the already good Boron-doped contact.

Significantly, there is no teaching in any of the prior art of record that the use of a structured amorphous Germanium layer would actually increase the energy resolution. Specifically, Luke *et. al* never taught that the replacement of a Boron-doped layer by an undoped amorphous Germanium layer would improve the energy resolution of a Hammacher-type detector.

The present application differs from the prior art at least in that it teaches the use of a structured amorphous Germanium layer. In reality, person of skill in the art would have had no basis to believe that there would be any significant difference between a structured or unstructured amorphous Germanium layer. Since the person skilled in the art expected a poor energy resolution with the use of an unstructured layer for the above mentioned reasons, it was not obvious for a person skilled in the art that the subject matter of claim 1 would lead to a detector with a significantly improved energy resolution. It is believed that a structured amorphous Germanium layer was first used by the present inventors, and that the surprising benefits of this feature were unknown to a person of skill in the art at the time the invention was made. *See* Protic Decl. ¶ 12.

Summary

In sum, there was no motivation to combine Hammacher with Luke to produce the inventions as embodied in the claims. First, there was no motivation at the time the invention was made to produce devices with better blocking contacts, because Boron provided an excellent blocking contact and because leakage currents were already low. Second, there was a disincentive to use amorphous Germanium as part of a contact, because it was expected that this would reduce energy resolution. With respect to the findings of record, only the Applicants teach a way to use amorphous Germanium in a manner that increases the energy resolution of the detector.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date January 31, 2008

By _____

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Attachment 1

Declaration of Davor Protic